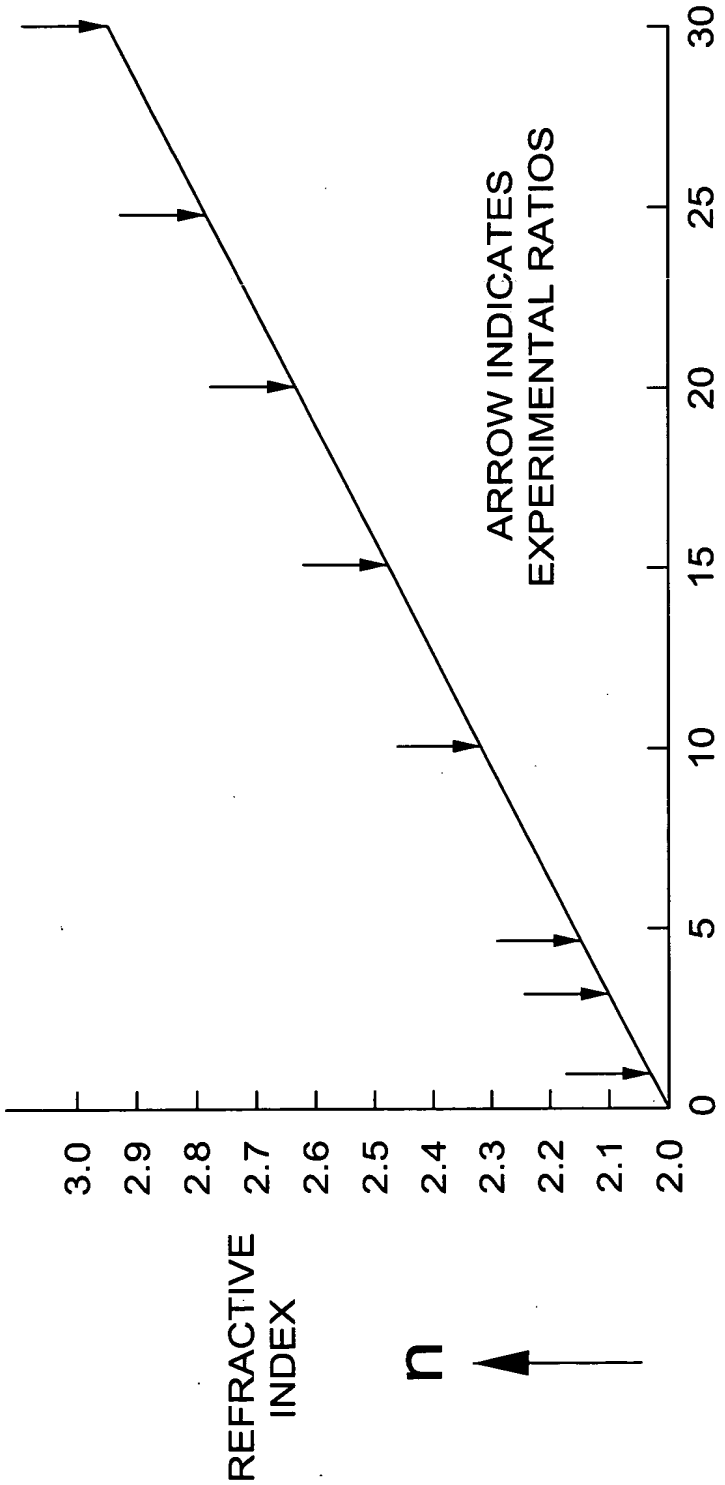


Fig. 1
(PRIOR ART)

T-06280 S86+969

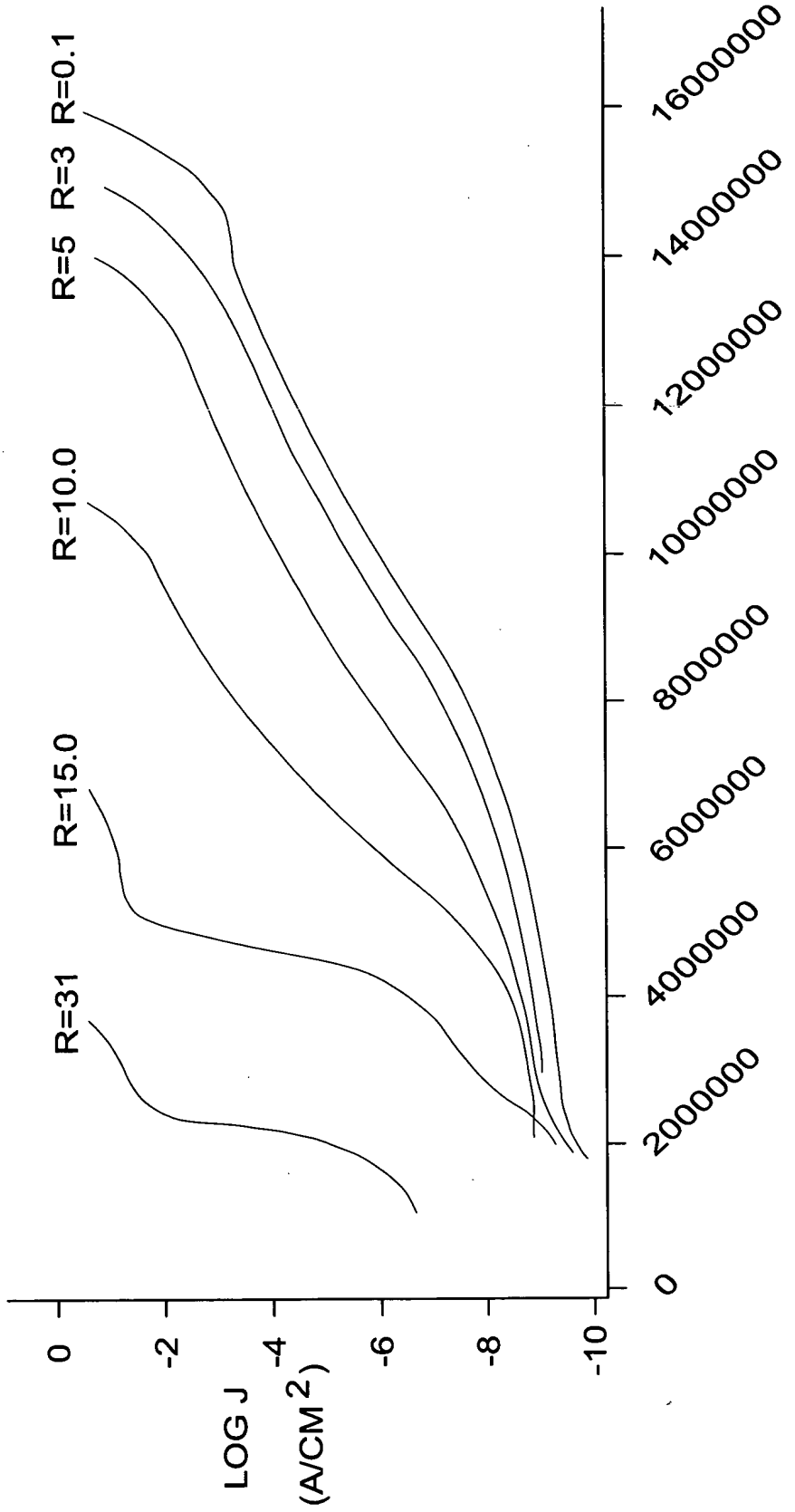


Fig. 2
(PRIOR ART)

Docket No. 1303.023US1

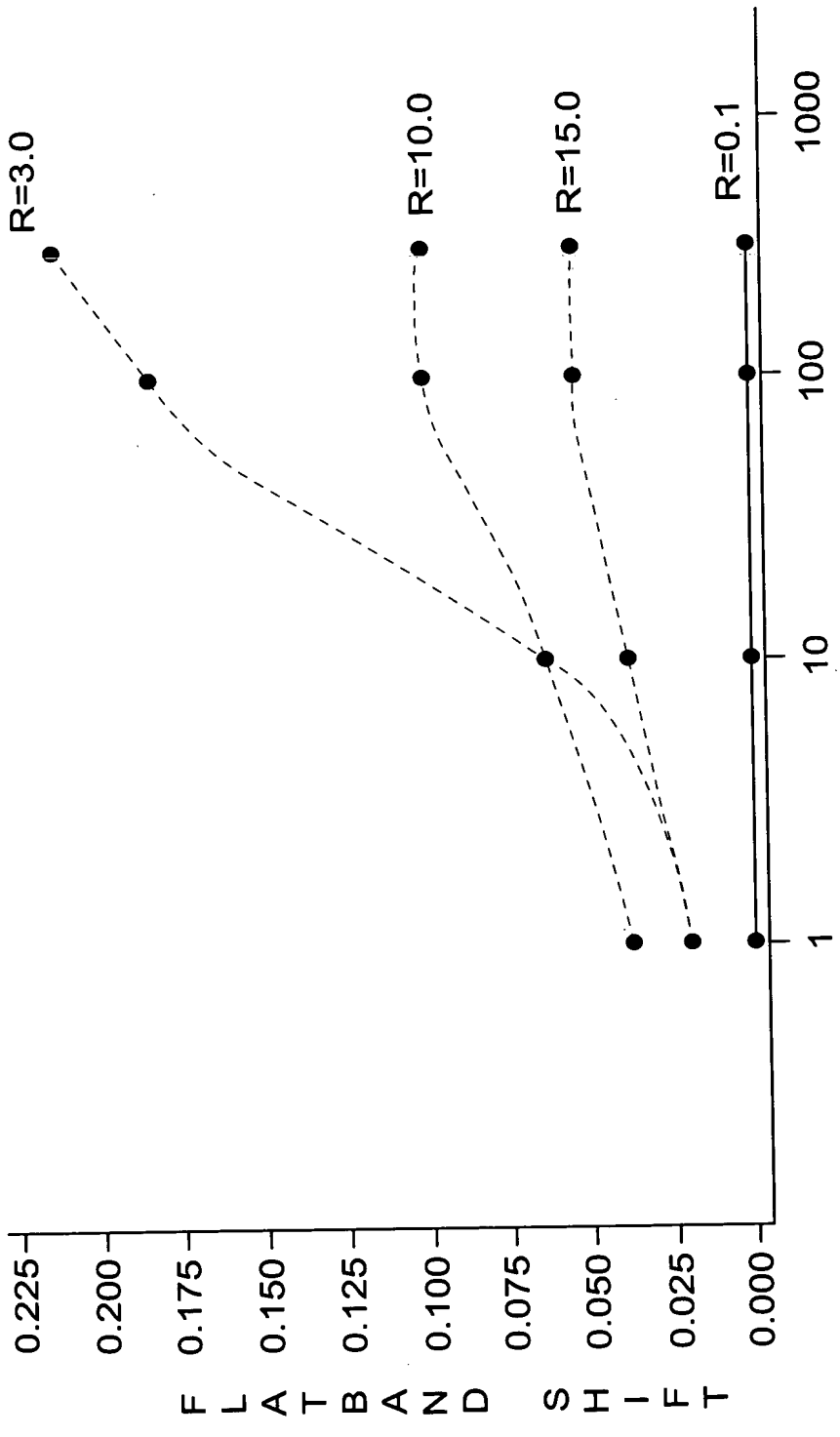


Fig. 3
(PRIOR ART)

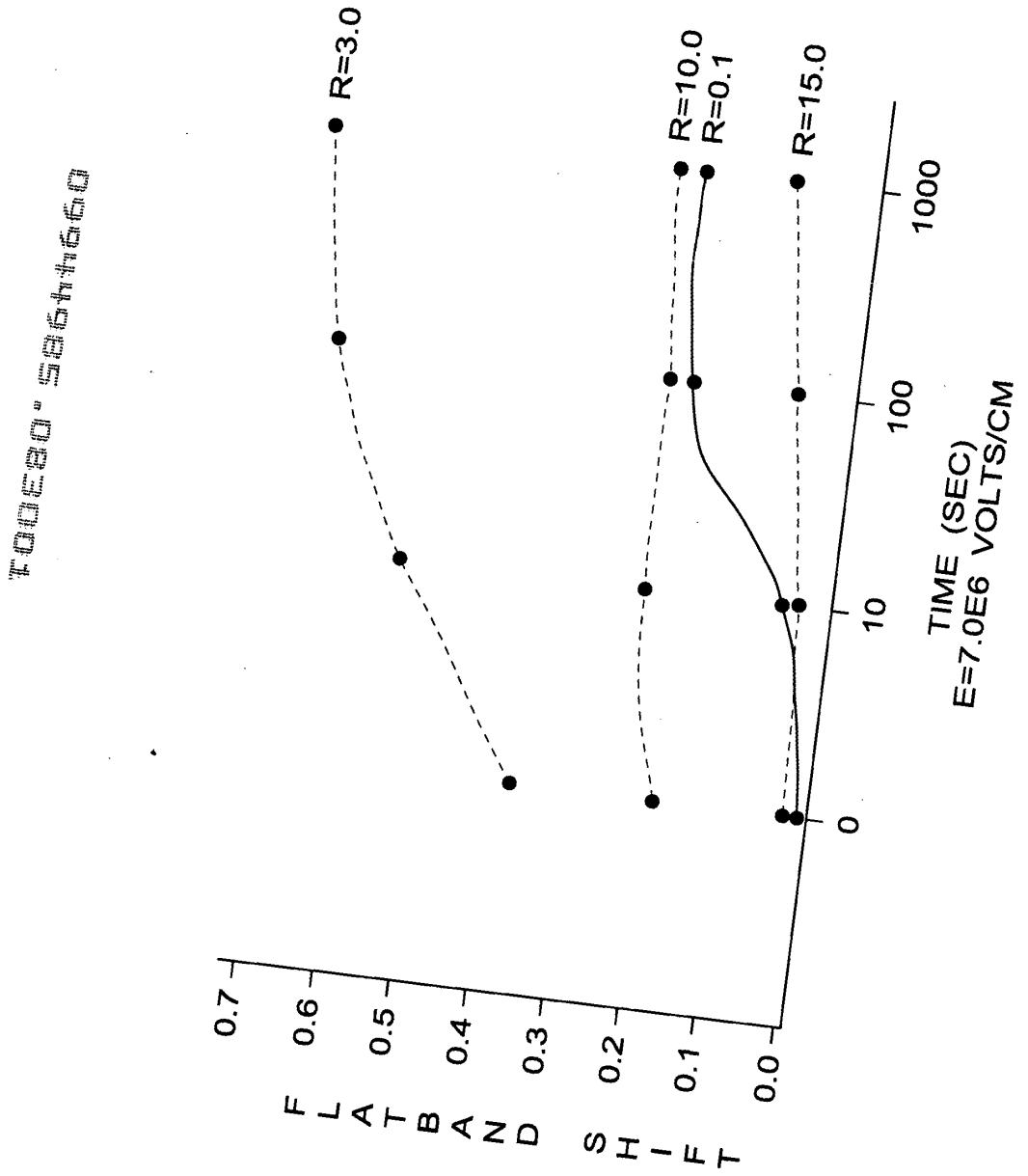


Fig. 4
(PRIOR ART)

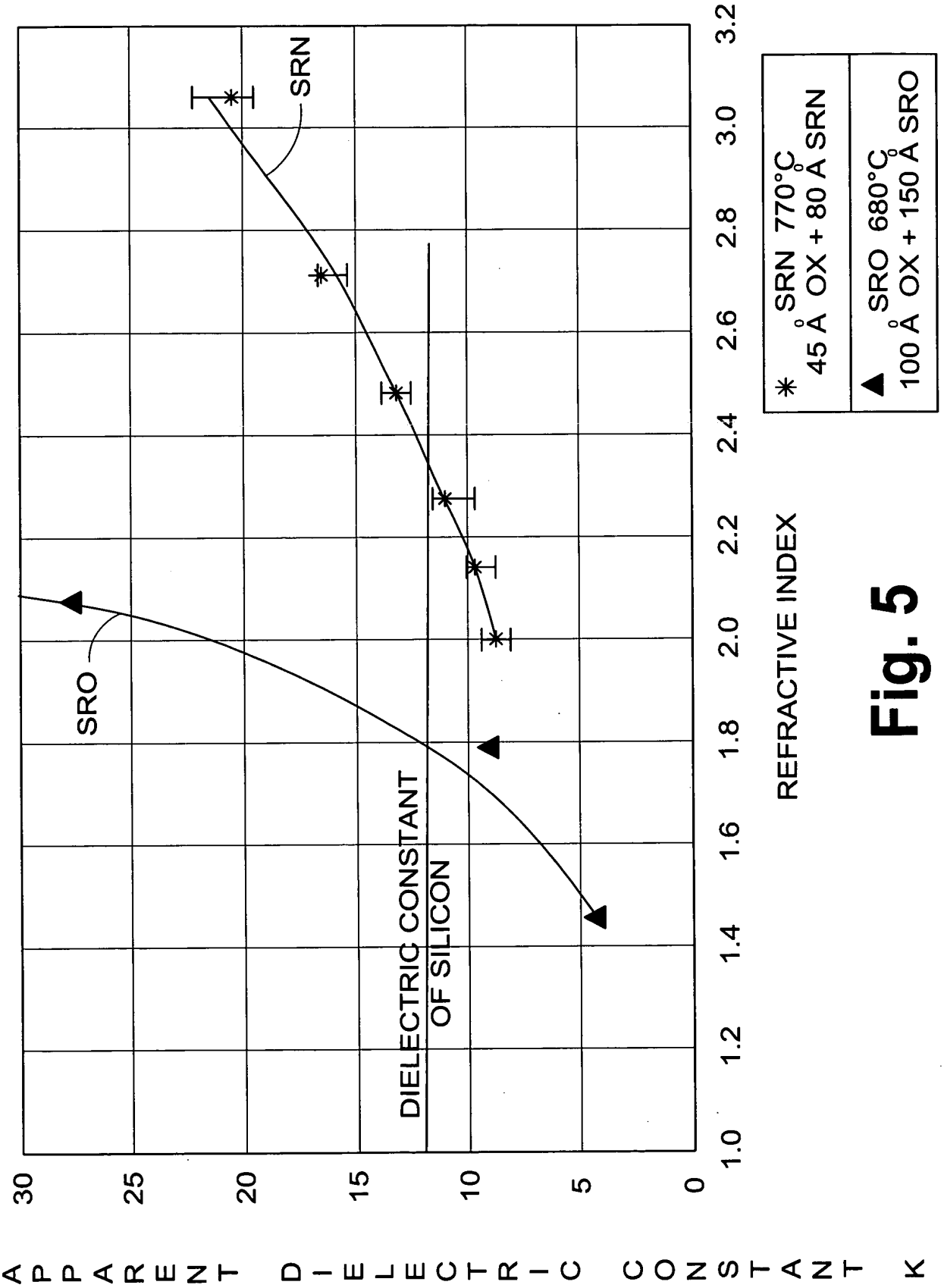


Fig. 5

Docket 1303.023US1

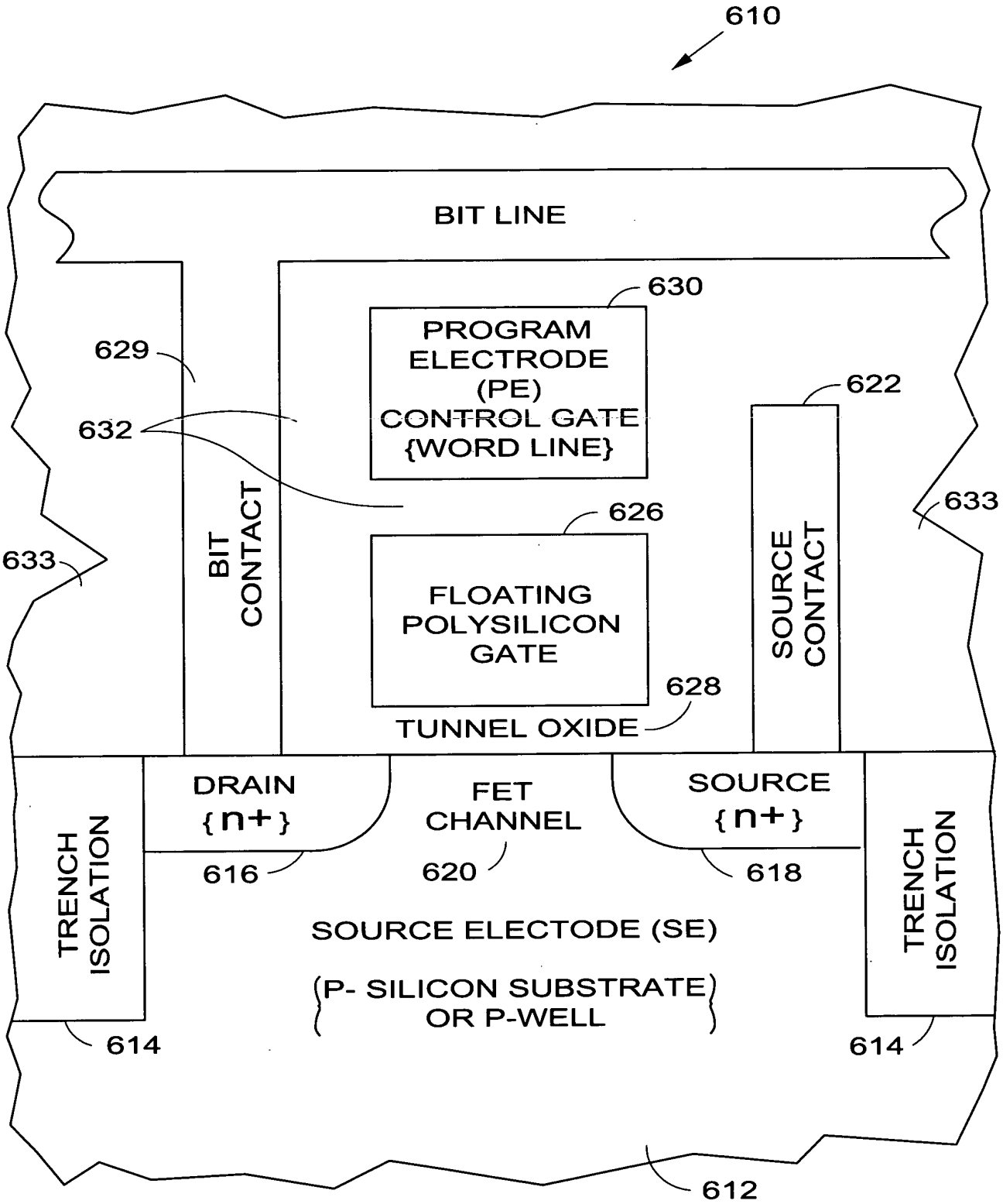


Fig. 6
(PRIOR ART)

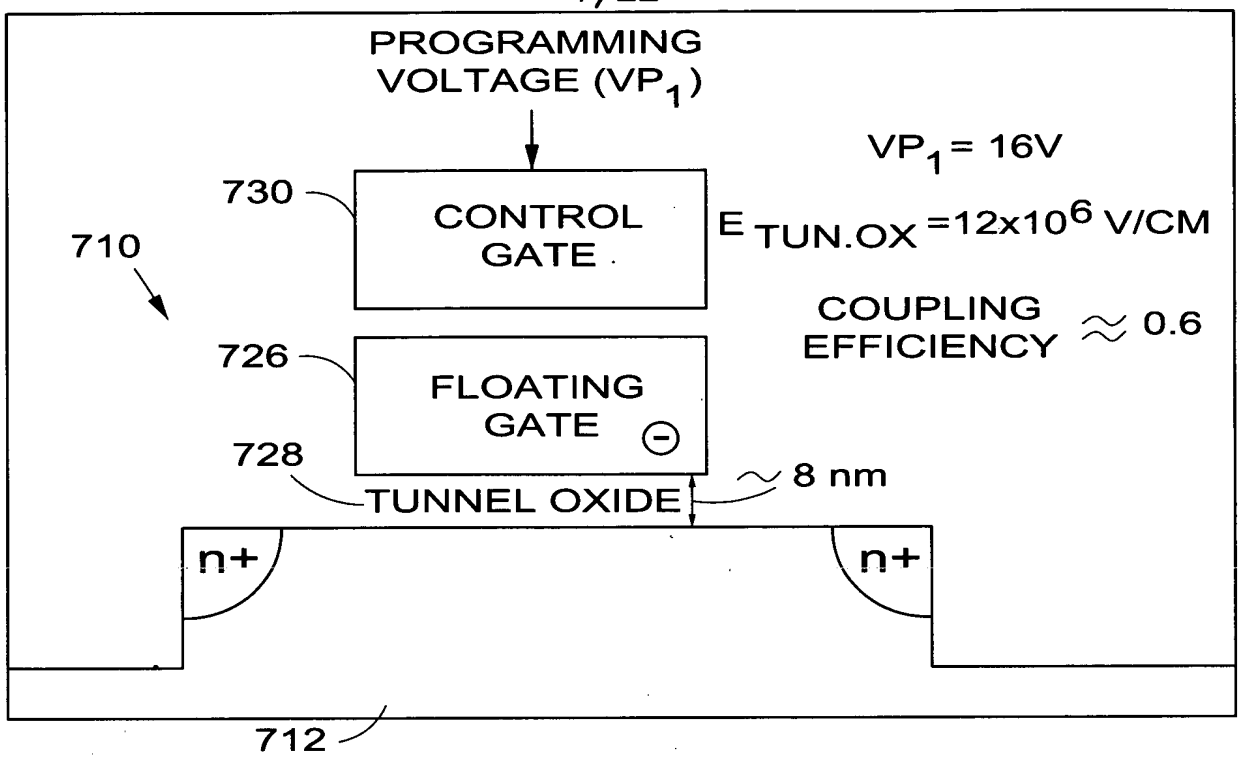

PROGRAMMING VOLTAGE (VP_1)
VP_1 = 16V
730
CONTROL GATE
$E_{TUN.OX}$ =12x10^6 V/CM
710
COUPLING EFFICIENCY ≈ 0.6
726
FLOATING GATE
728
TUNNEL OXIDE
≈ 8 nm
n+
n+
712

Fig. 7

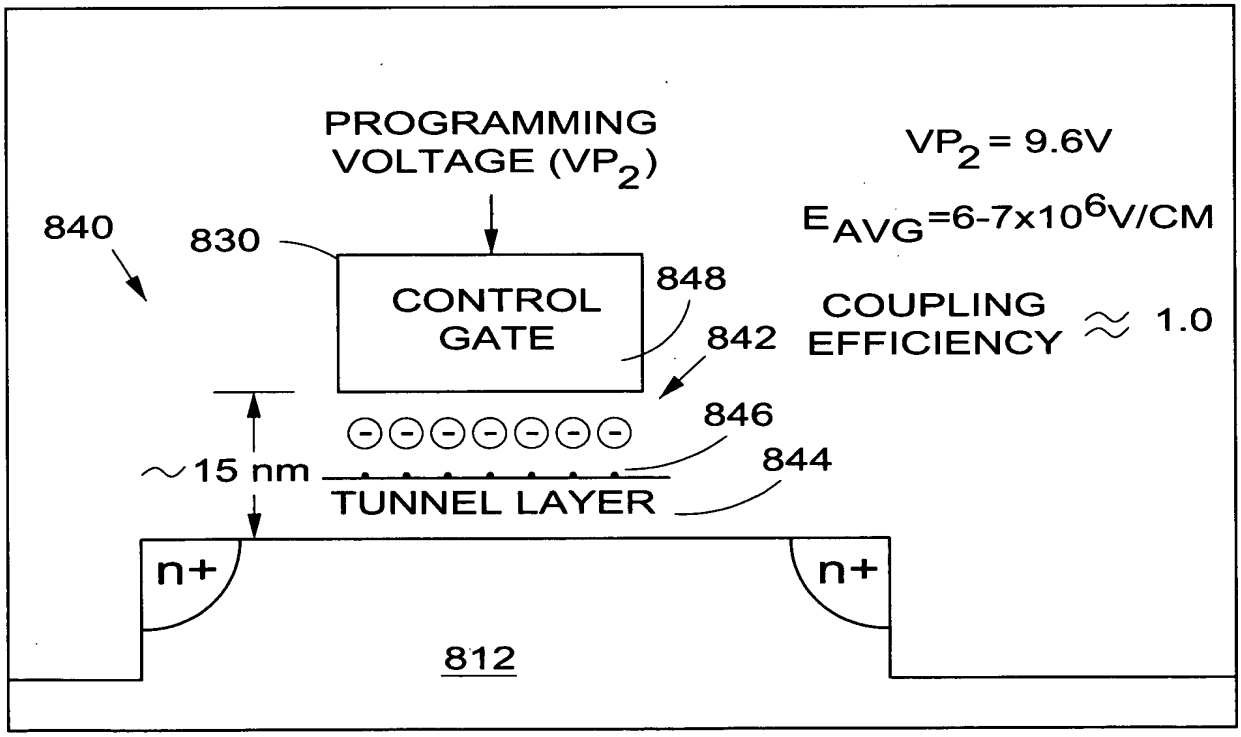

PROGRAMMING VOLTAGE (VP_2)
VP_2 = 9.6V
E_{AVG}=6-7x10^{6}V/CM
840
830
CONTROL GATE
848
842
COUPLING EFFICIENCY ≈ 1.0
846
≈15 nm
844
TUNNEL LAYER
n+
n+
812

Fig. 8

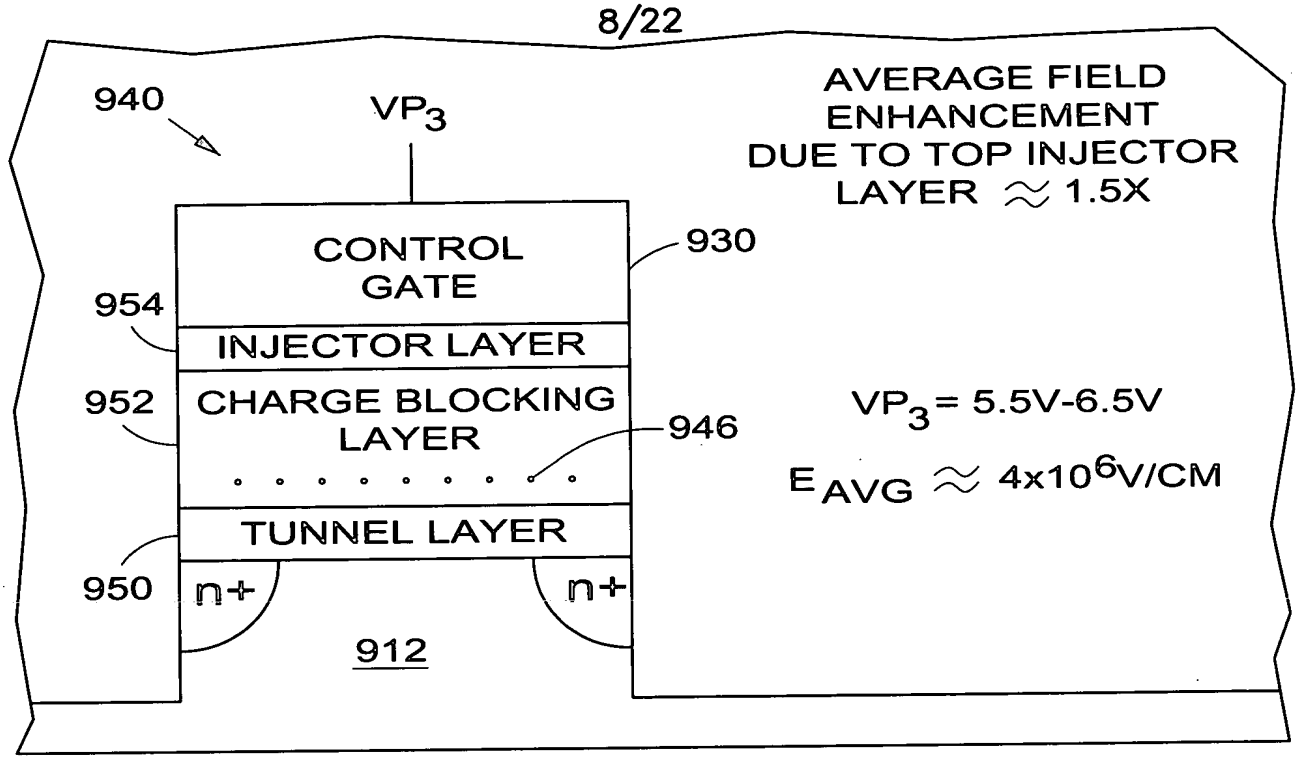


Fig. 9

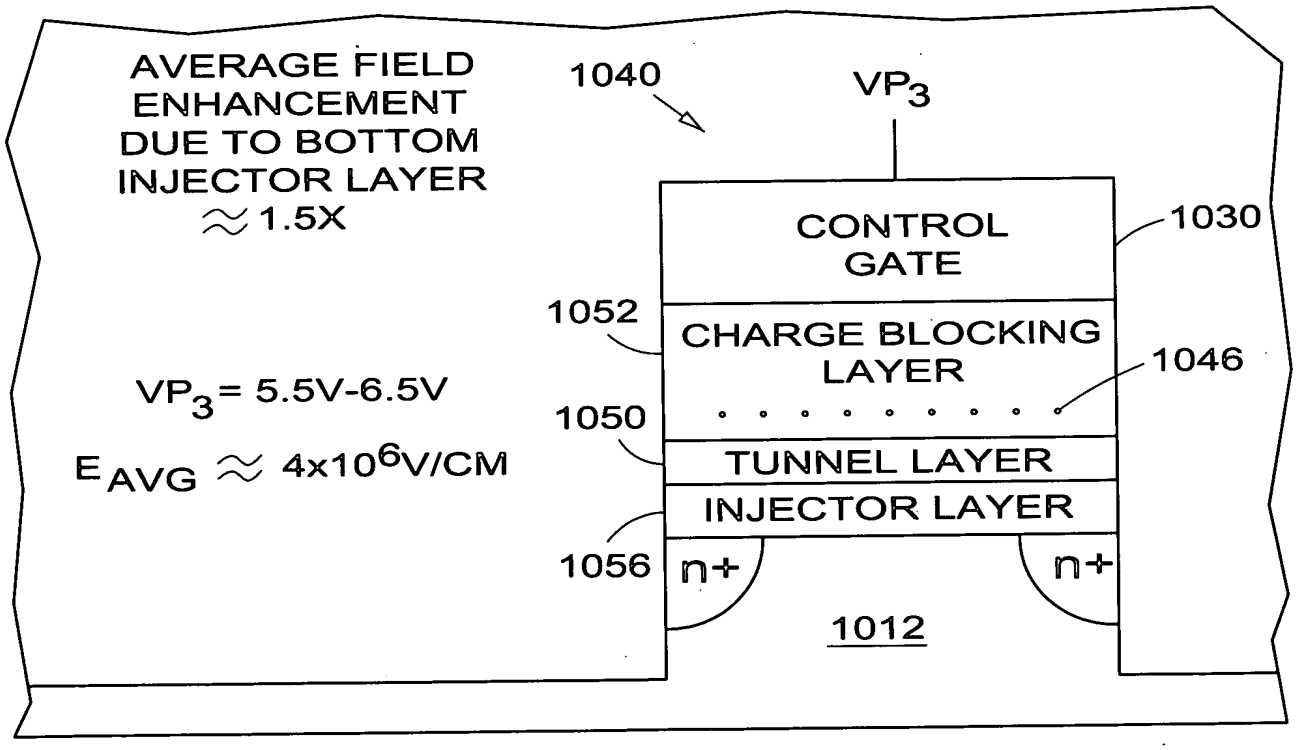


Fig. 10

Express Mail Label No. EV339945460

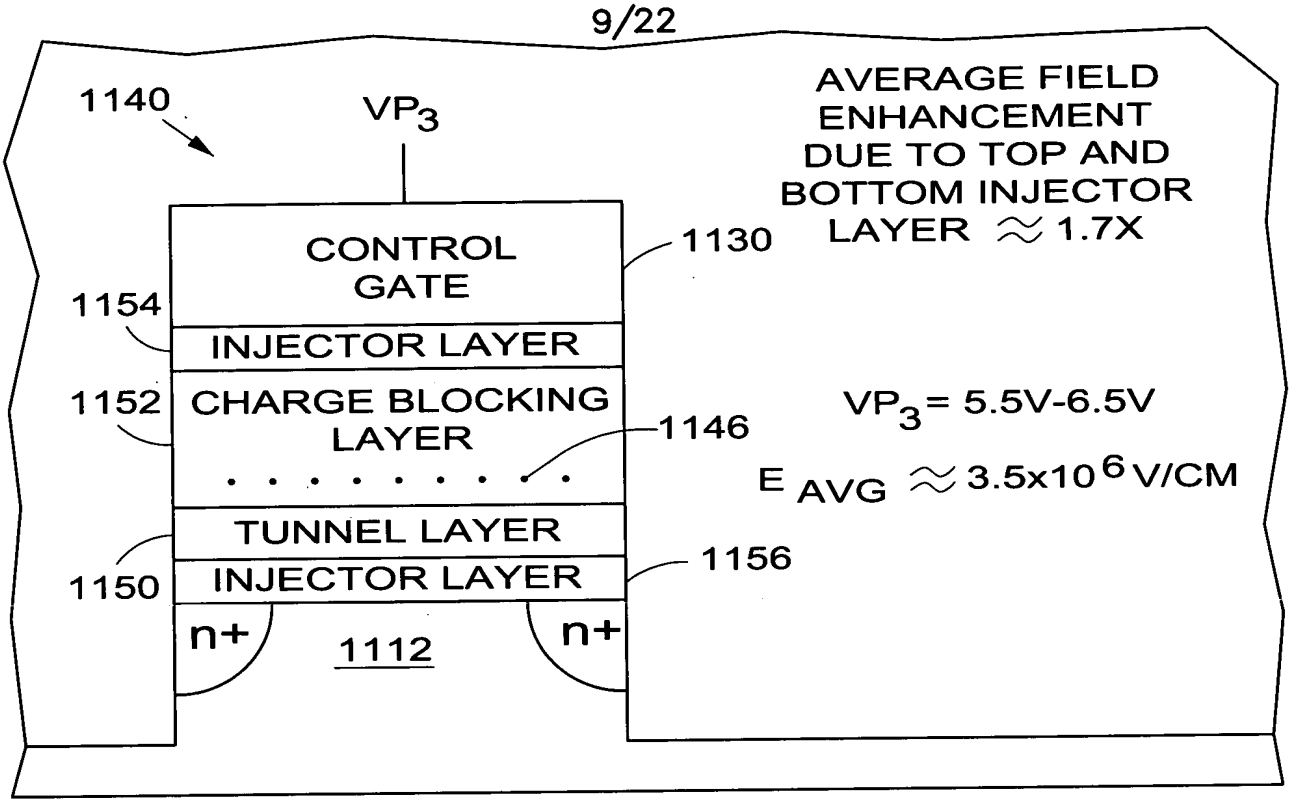

1140
VP3
AVERAGE FIELD ENHANCEMENT DUE TO TOP AND BOTTOM INJECTOR LAYER ≈ 1.7X
CONTROL GATE
1130
1154
INJECTOR LAYER
1152
CHARGE BLOCKING LAYER
1146
VP3 = 5.5V-6.5V
E AVG ≈ 3.5x10 6 V/CM
TUNNEL LAYER
1150
INJECTOR LAYER
1156
n+
1112
n+

Fig. 11

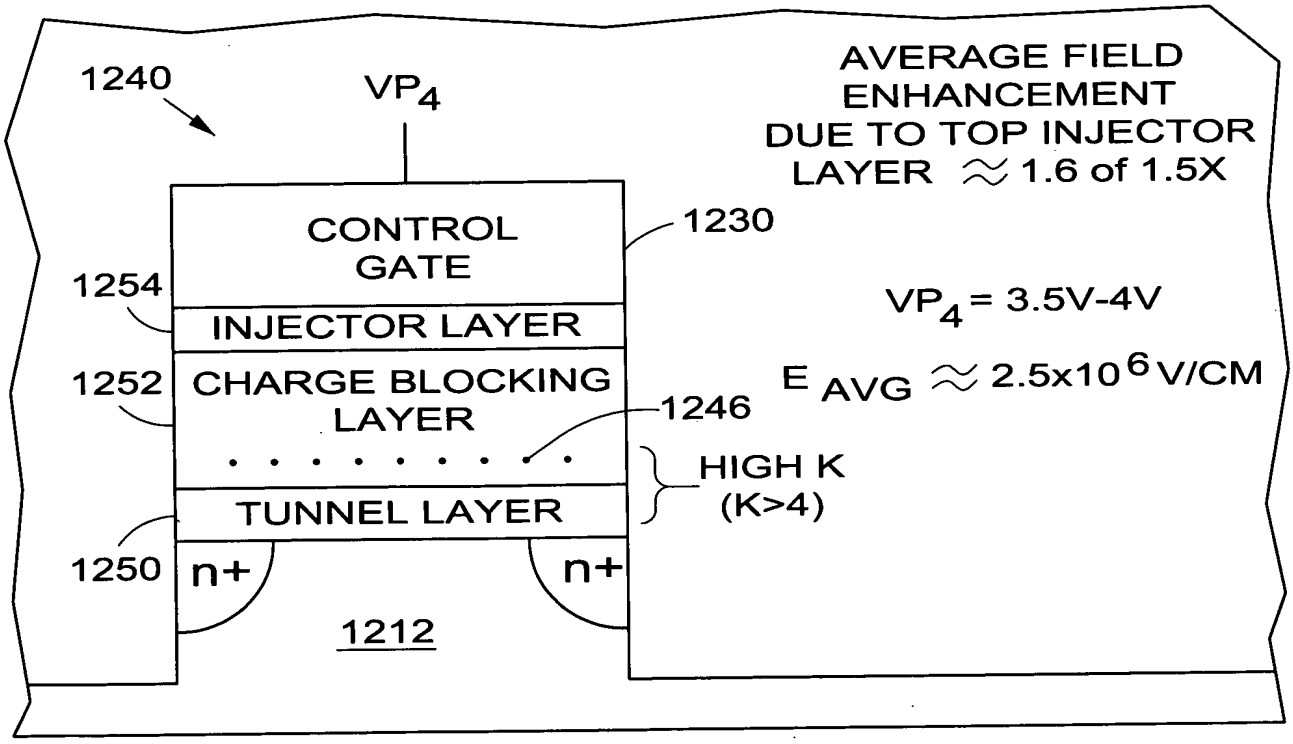

1240
VP4
AVERAGE FIELD ENHANCEMENT DUE TO TOP INJECTOR LAYER ≈ 1.6 of 1.5X
CONTROL GATE
1230
1254
INJECTOR LAYER
VP4 = 3.5V-4V
1252
CHARGE BLOCKING LAYER
1246
E AVG ≈ 2.5x10 6 V/CM
HIGH K (K>4)
TUNNEL LAYER
1250
n+
n+
1212

Fig. 12

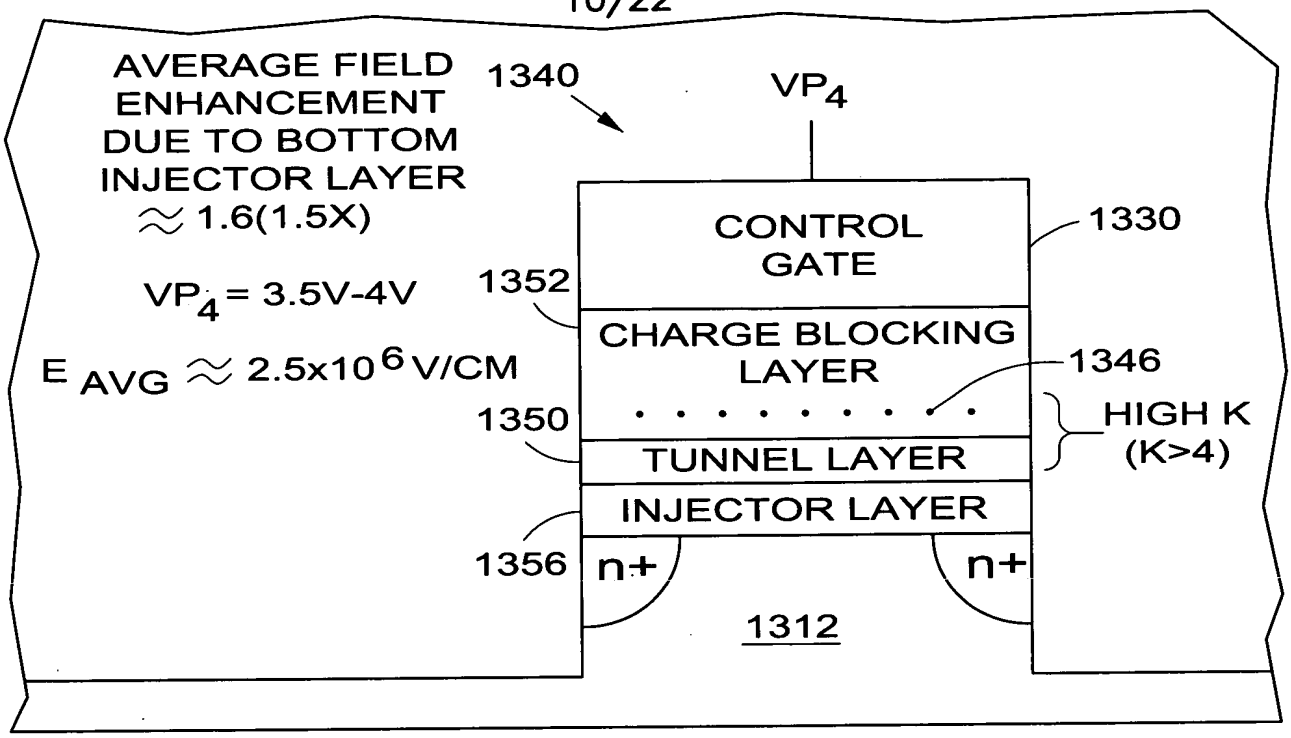

AVERAGE FIELD ENHANCEMENT DUE TO BOTTOM INJECTOR LAYER ≈ 1.6(1.5X)
VP_4 = 3.5V-4V
$E_{AVG} \approx 2.5x10^6$ V/CM
1340
VP_4
CONTROL GATE
1330
1352
CHARGE BLOCKING LAYER
1346
1350
TUNNEL LAYER
HIGH K (K>4)
INJECTOR LAYER
1356
n+
n+
1312

Fig. 13

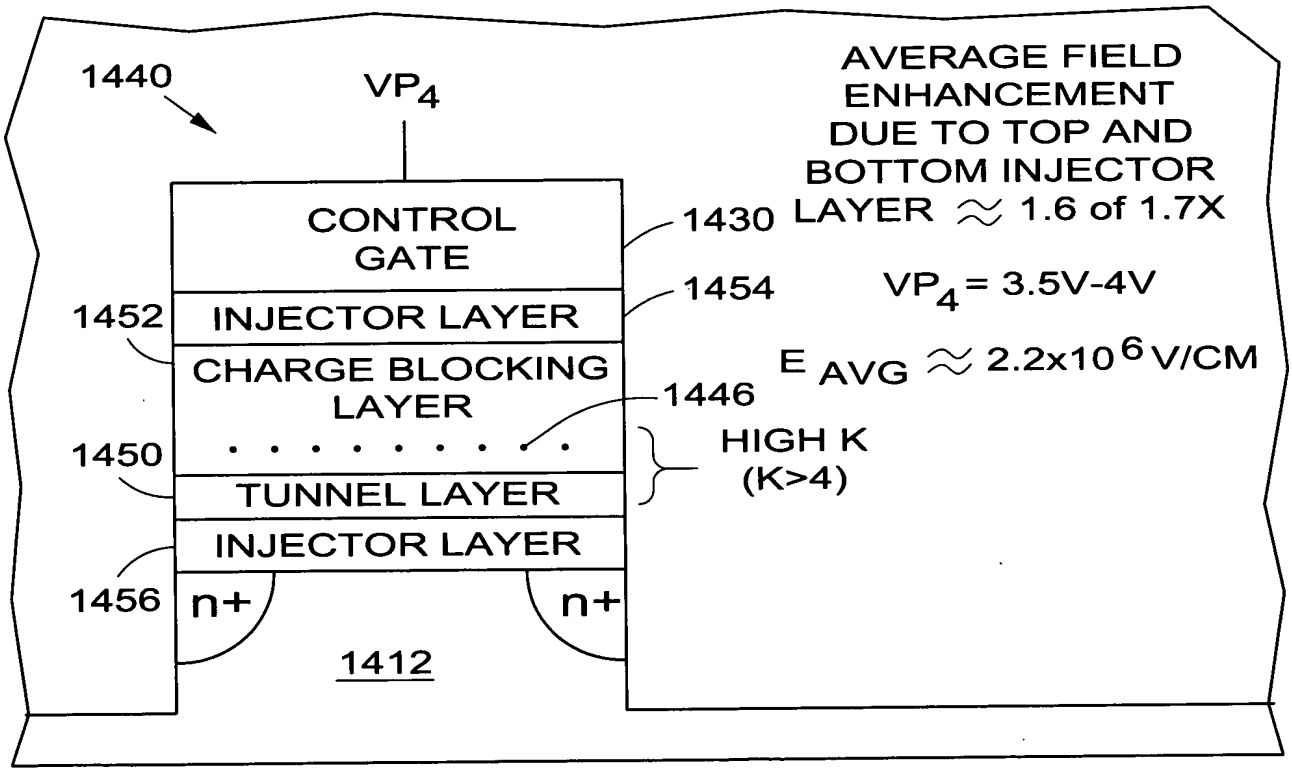

1440
VP_4
AVERAGE FIELD ENHANCEMENT DUE TO TOP AND BOTTOM INJECTOR LAYER ≈ 1.6 of 1.7X
VP_4 = 3.5V-4V
$E_{AVG} \approx 2.2x10^6$ V/CM
CONTROL GATE
1430
1454
1452
INJECTOR LAYER
CHARGE BLOCKING LAYER
1446
1450
HIGH K (K>4)
TUNNEL LAYER
INJECTOR LAYER
1456
n+
n+
1412

Fig. 14

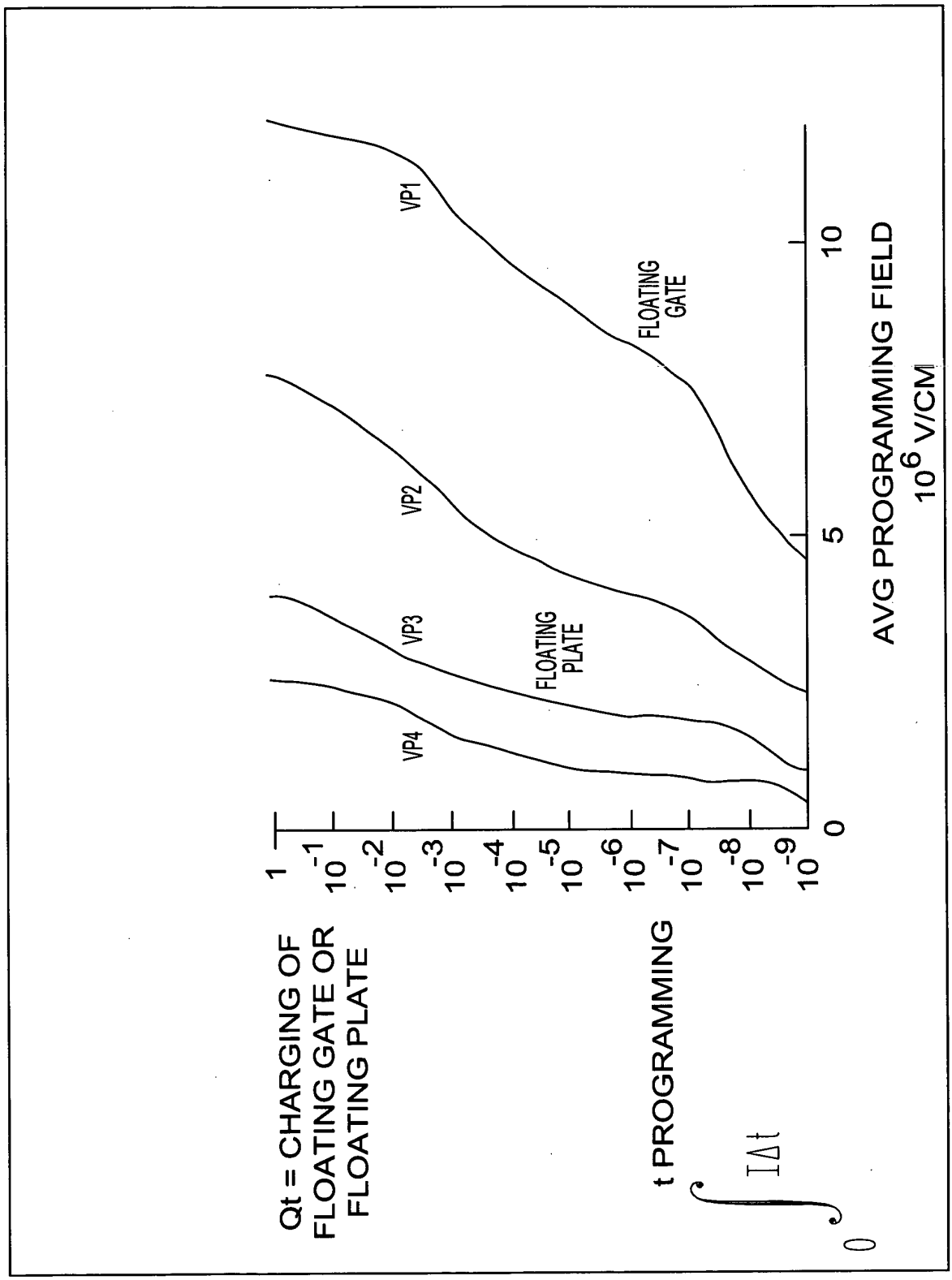

Qt = CHARGING OF FLOATING GATE OR FLOATING PLATE
1
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
VP4
VP3
VP2
VP1
FLOATING PLATE
FLOATING GATE
0
5
10
AVG PROGRAMMING FIELD
10^6 V/CM
t PROGRAMMING
$\int_0 I\Delta t$

Fig. 15

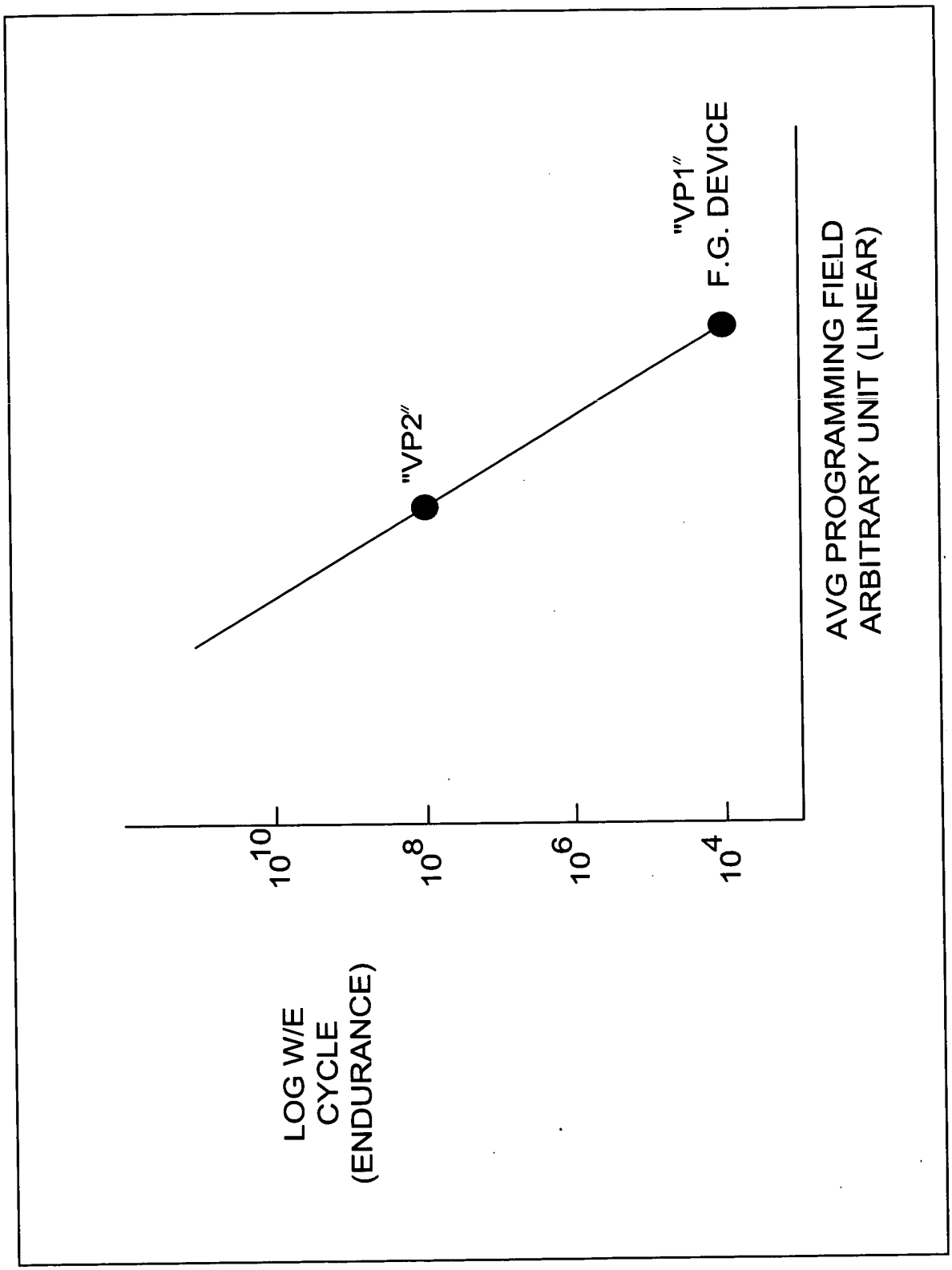


Fig. 16

"Express Mail" Label No. EV 325476560

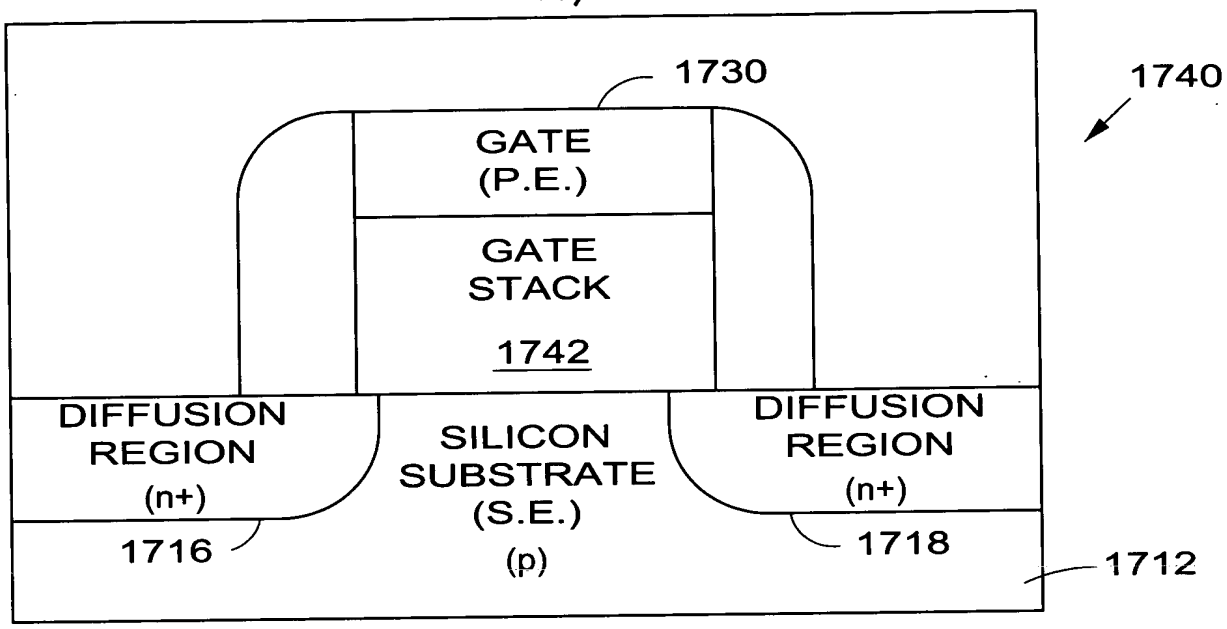


Fig. 17

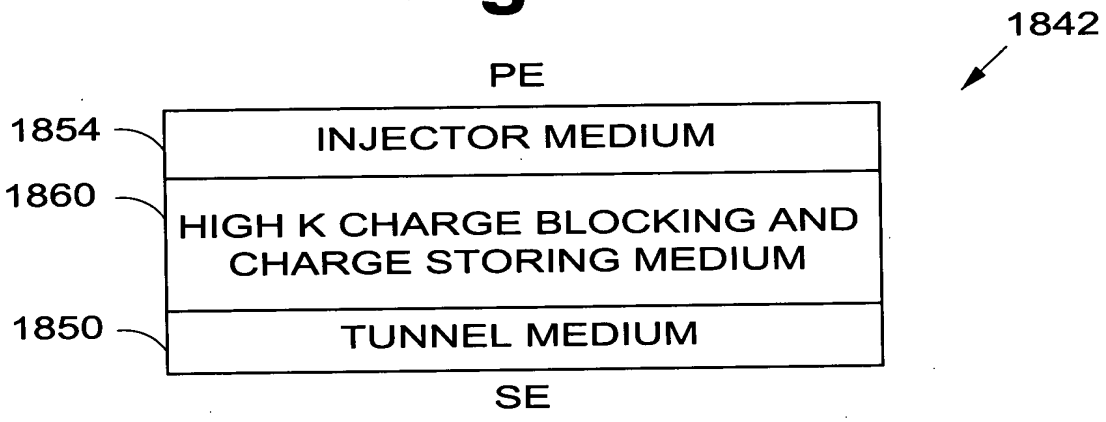


Fig. 18

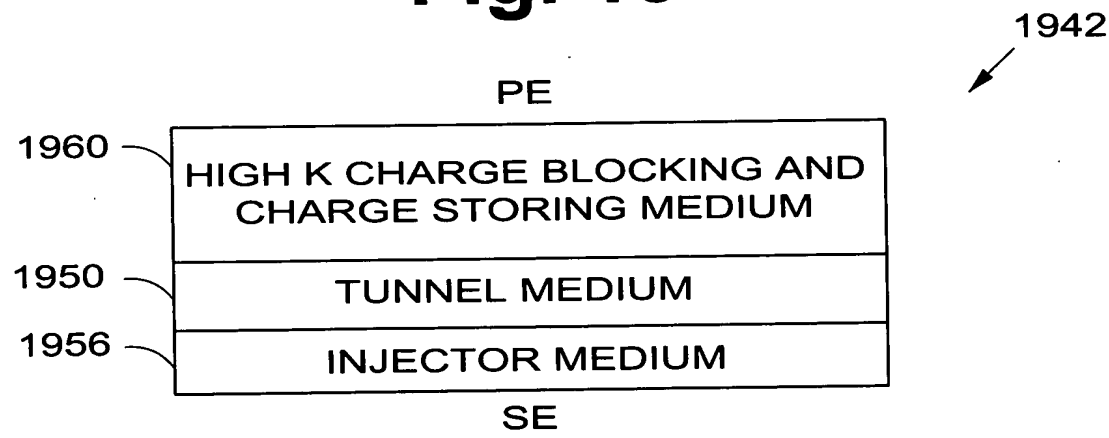


Fig. 19

4092490 - 5884660

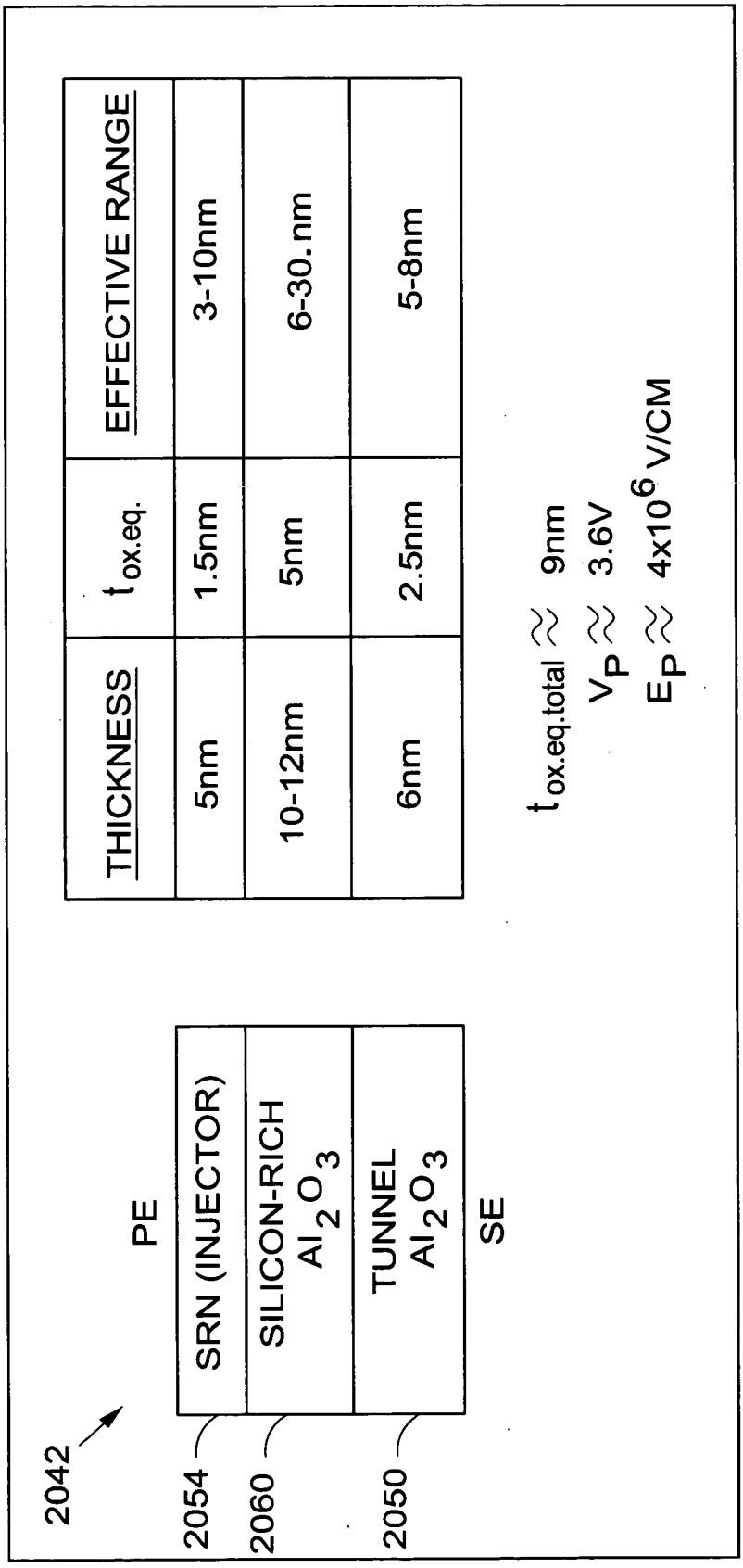

2042
PE
2054
SRN (INJECTOR)
2060
SILICON-RICH Al_2O_3
2050
TUNNEL Al_2O_3
SE
THICKNESS
$t_{ox.eq.}$
EFFECTIVE RANGE
5nm
1.5nm
3-10nm
10-12nm
5nm
6-30. nm
6nm
2.5nm
5-8nm
$t_{ox.eq.total} \approx$ 9nm
$V_P \approx$ 3.6V
$E_P \approx 4x10^6$ V/CM

Fig. 20

Tue Sep 5 15:36:16 2006

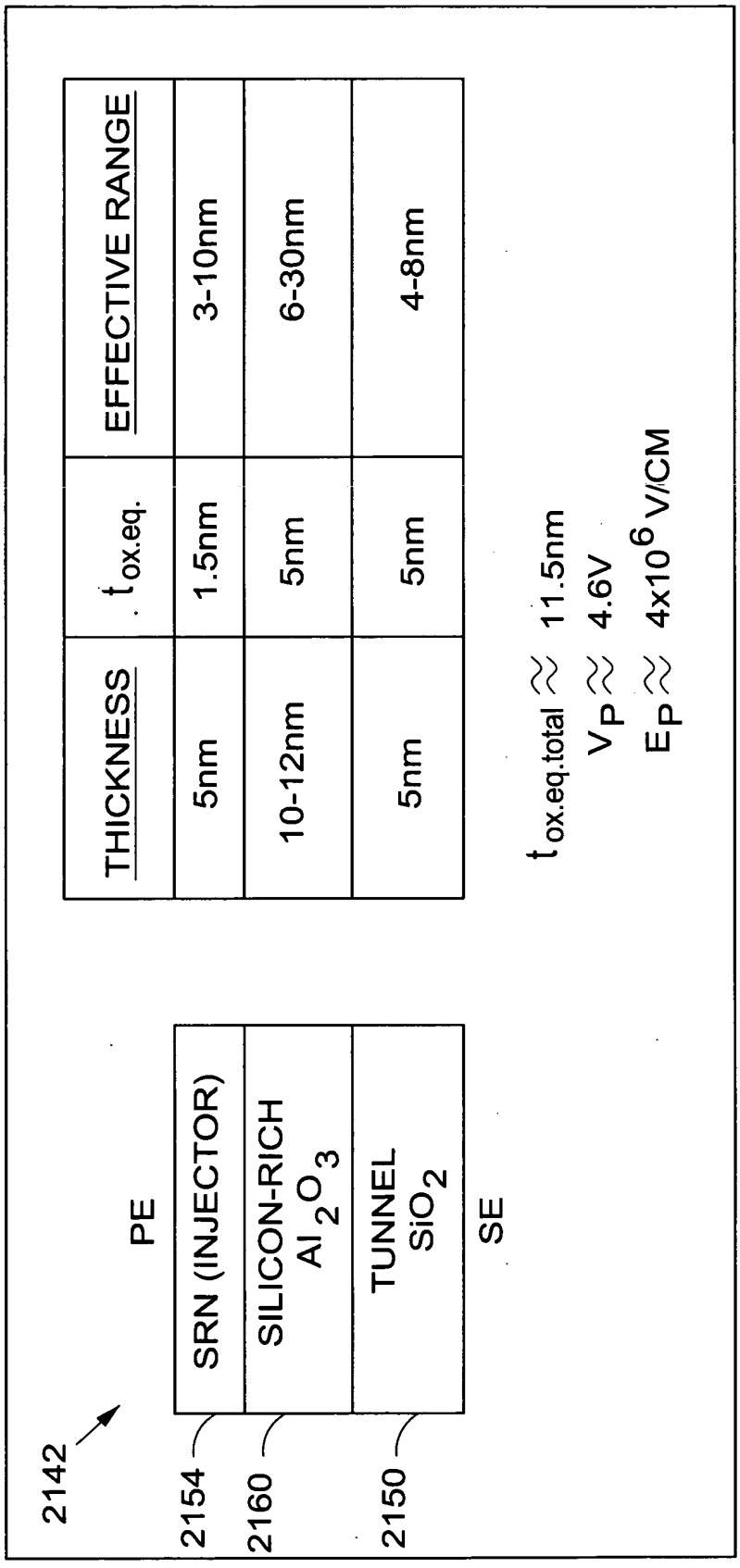


Fig. 21

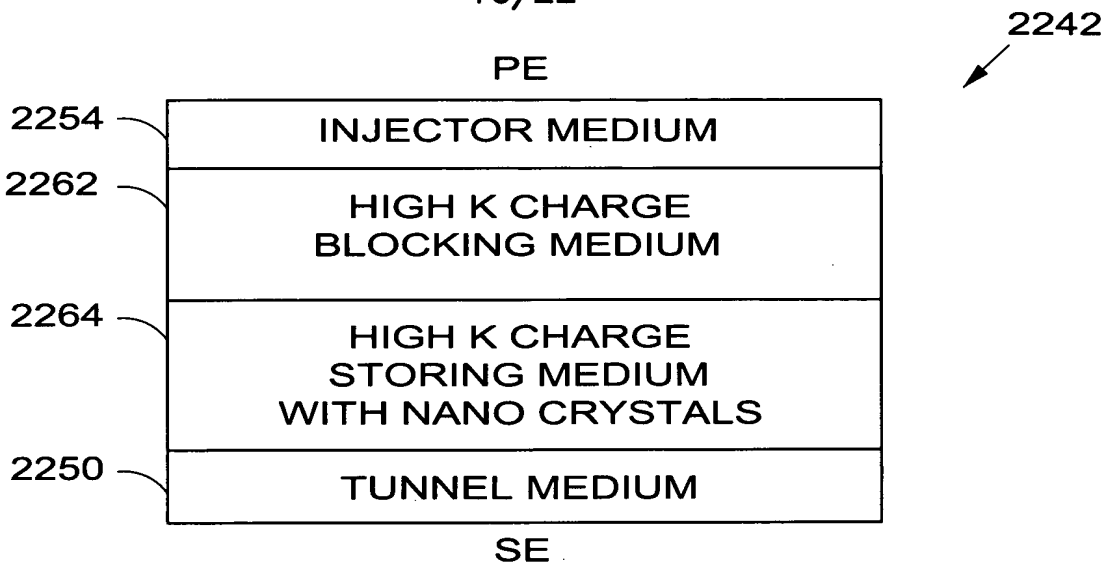


Fig. 22

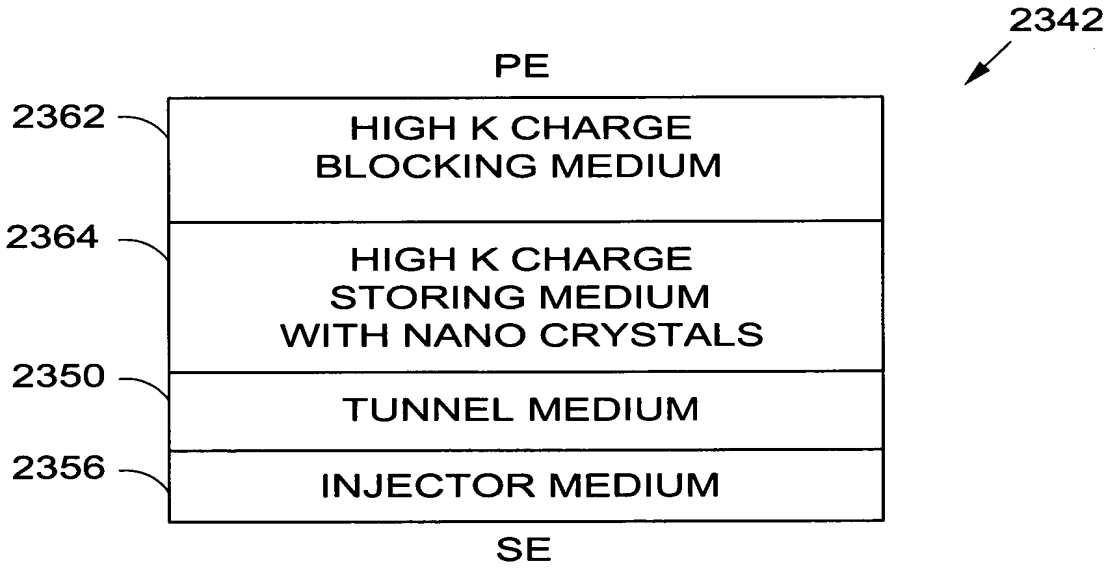


Fig. 23

1303.023US1 - 08/05/2004 5:09:34 PM

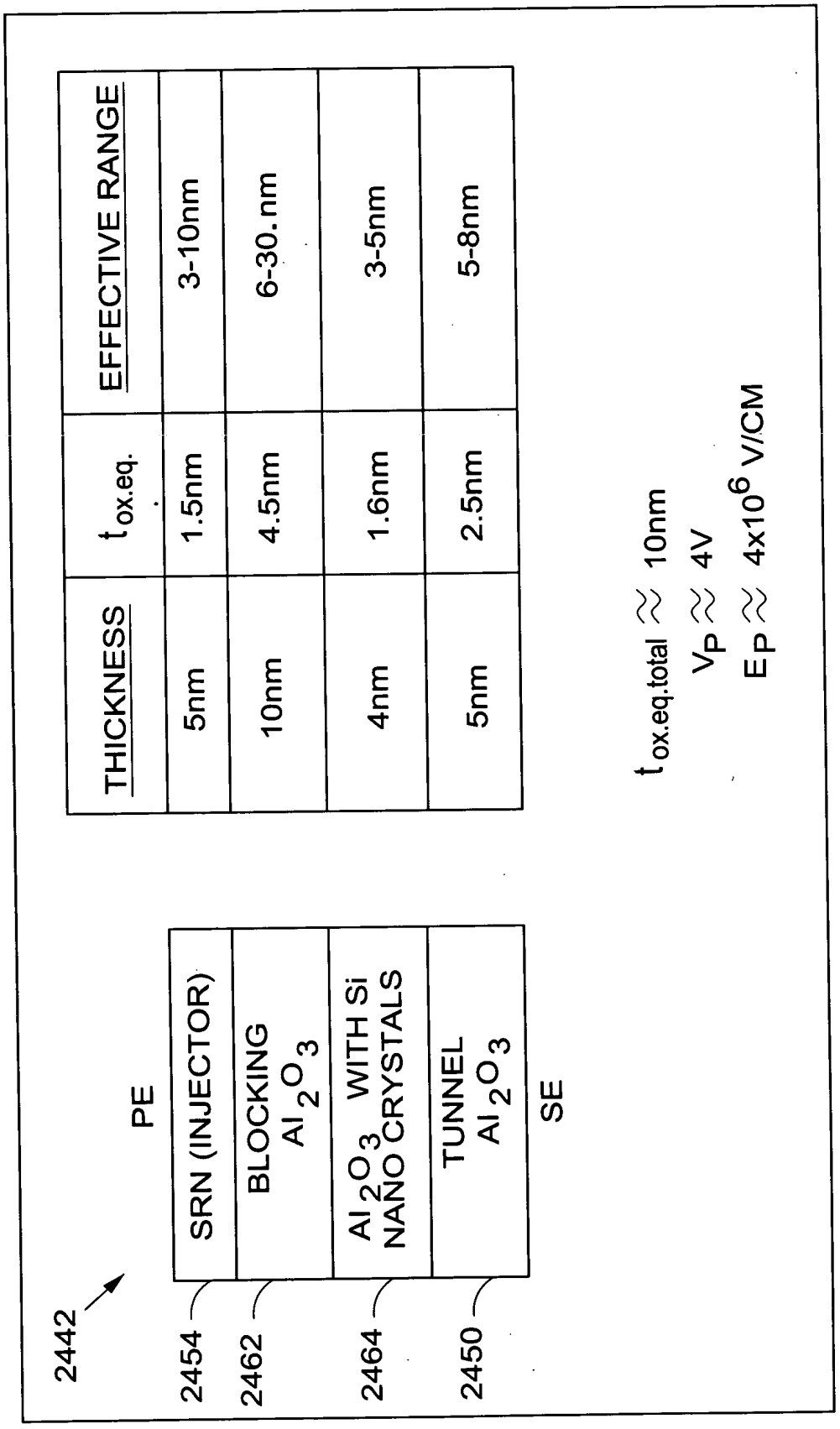

2442
PE
SRN (INJECTOR)
BLOCKING Al_2O_3
Al_2O_3 WITH Si NANO CRYSTALS
TUNNEL Al_2O_3
SE
2454
2462
2464
2450
THICKNESS
$t_{ox.eq.}$
EFFECTIVE RANGE
5nm
1.5nm
3-10nm
10nm
4.5nm
6-30. nm
4nm
1.6nm
3-5nm
5nm
2.5nm
5-8nm
$t_{ox.eq.total} \approx 10nm$
$V_P \approx 4V$
$E_P \approx 4x10^6$ V/CM

Fig. 24

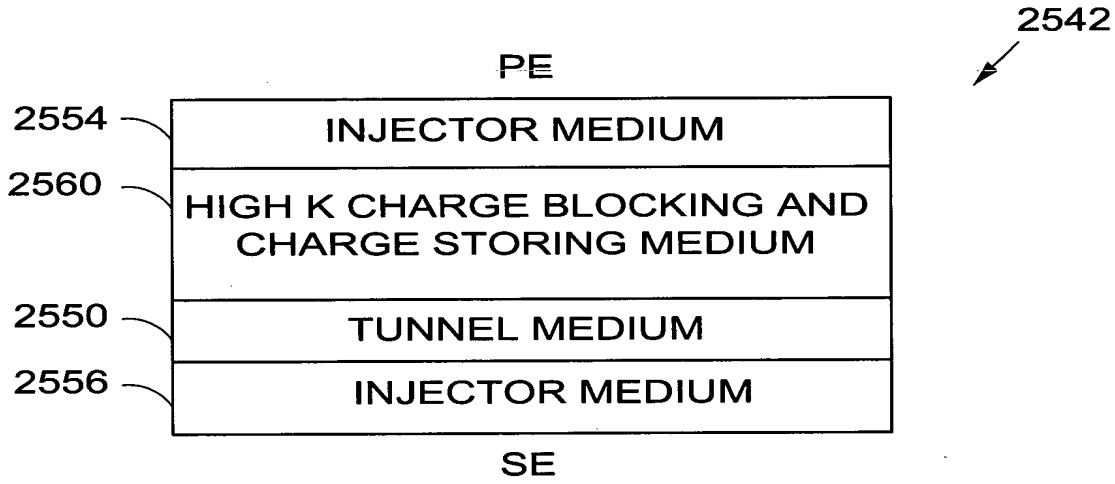

2542
PE
2554
INJECTOR MEDIUM
2560
HIGH K CHARGE BLOCKING AND CHARGE STORING MEDIUM
2550
TUNNEL MEDIUM
2556
INJECTOR MEDIUM
SE

Fig. 25

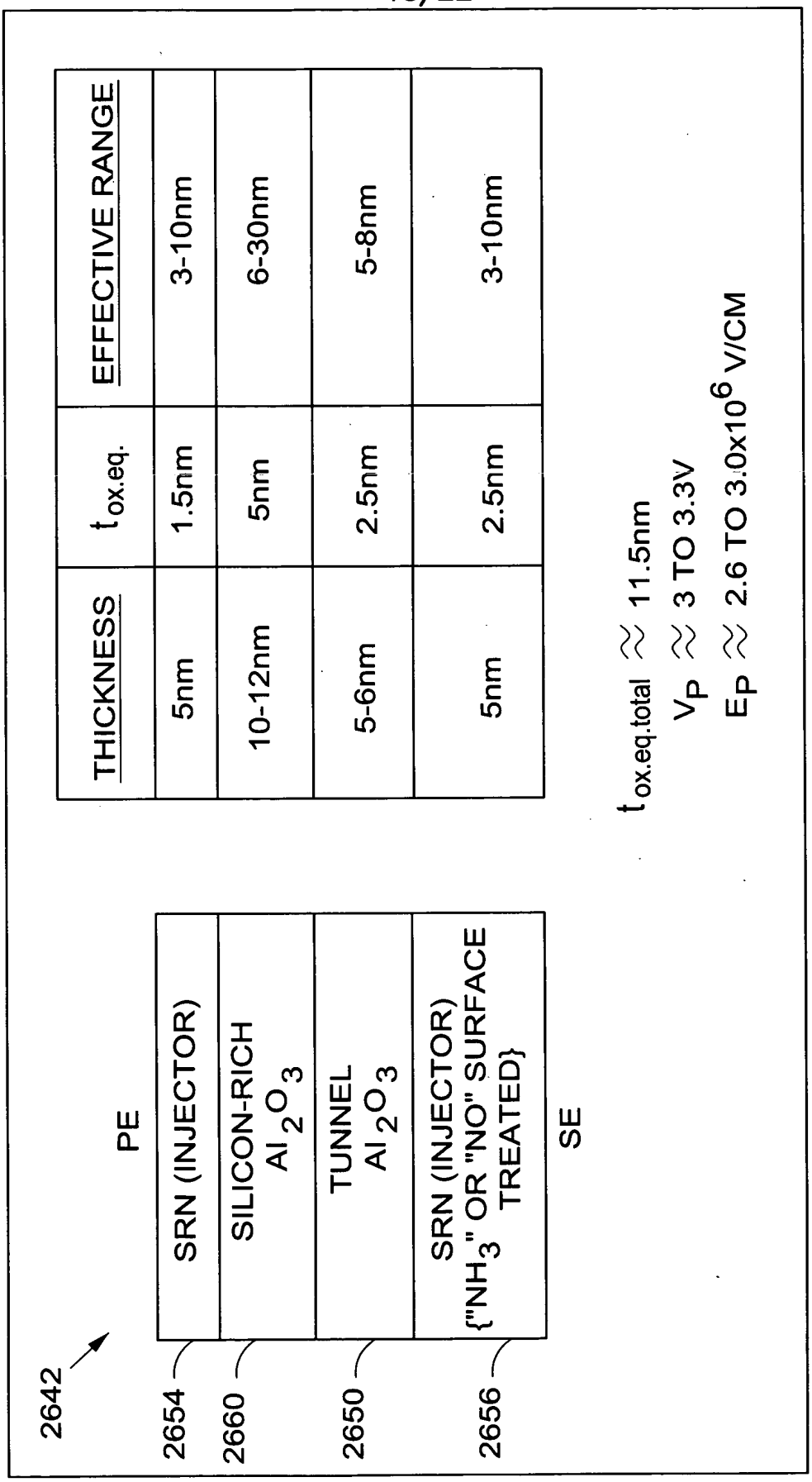


Fig. 26

PD-60280 5864h660

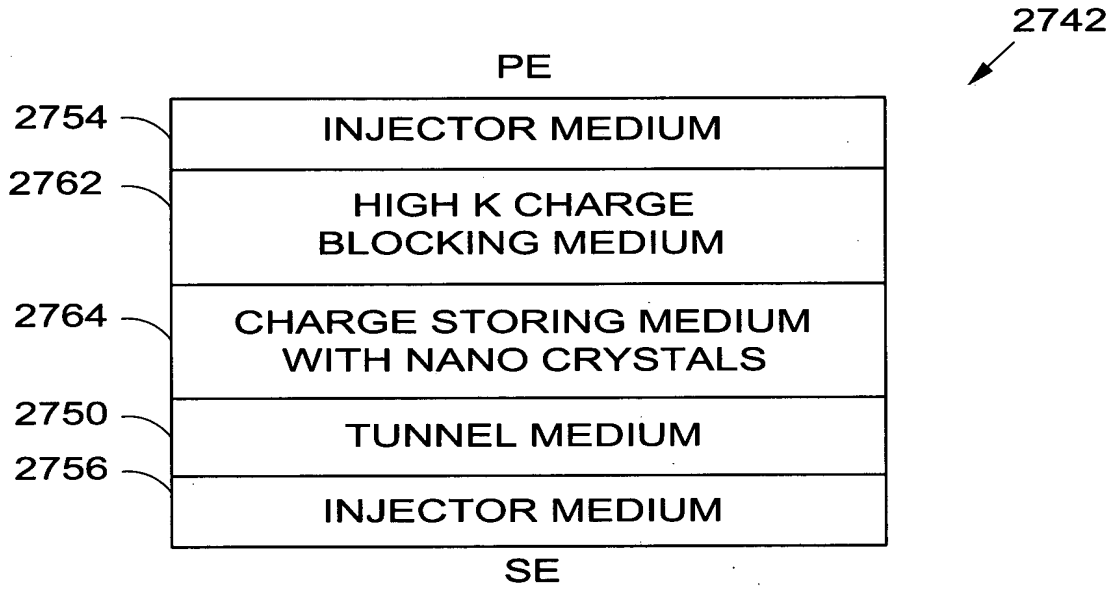
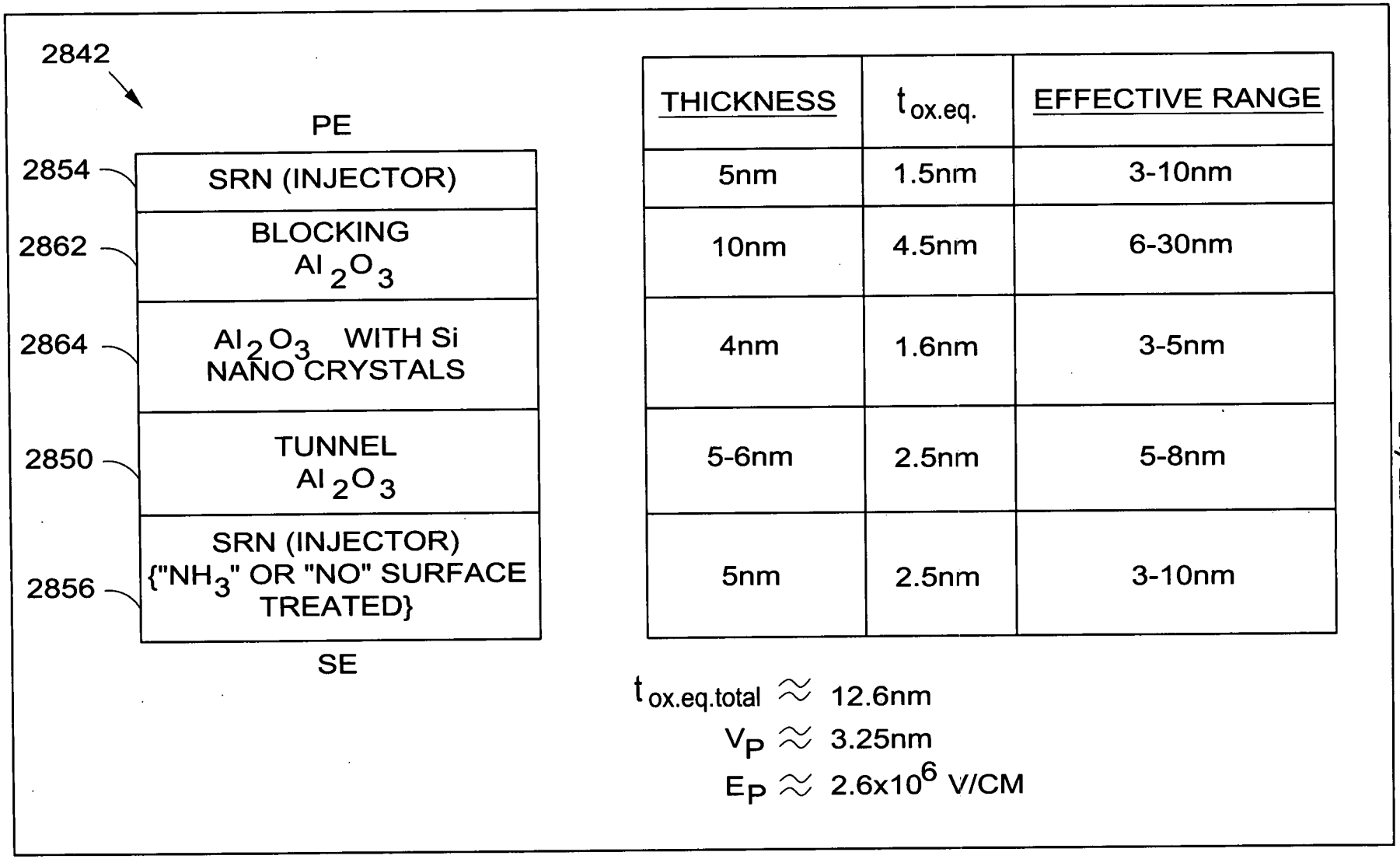

2742
PE
2754
INJECTOR MEDIUM
2762
HIGH K CHARGE BLOCKING MEDIUM
2764
CHARGE STORING MEDIUM WITH NANO CRYSTALS
2750
TUNNEL MEDIUM
2756
INJECTOR MEDIUM
SE

Fig. 27



THICKNESS	$t_{ox.eq.}$	EFFECTIVE RANGE
5nm	1.5nm	3-10nm
10nm	4.5nm	6-30nm
4nm	1.6nm	3-5nm
5-6nm	2.5nm	5-8nm
5nm	2.5nm	3-10nm

$t_{ox.eq.total} \approx 12.6nm$

$V_P \approx 3.25nm$

$E_P \approx 2.6x10^6$ V/CM

Fig. 28

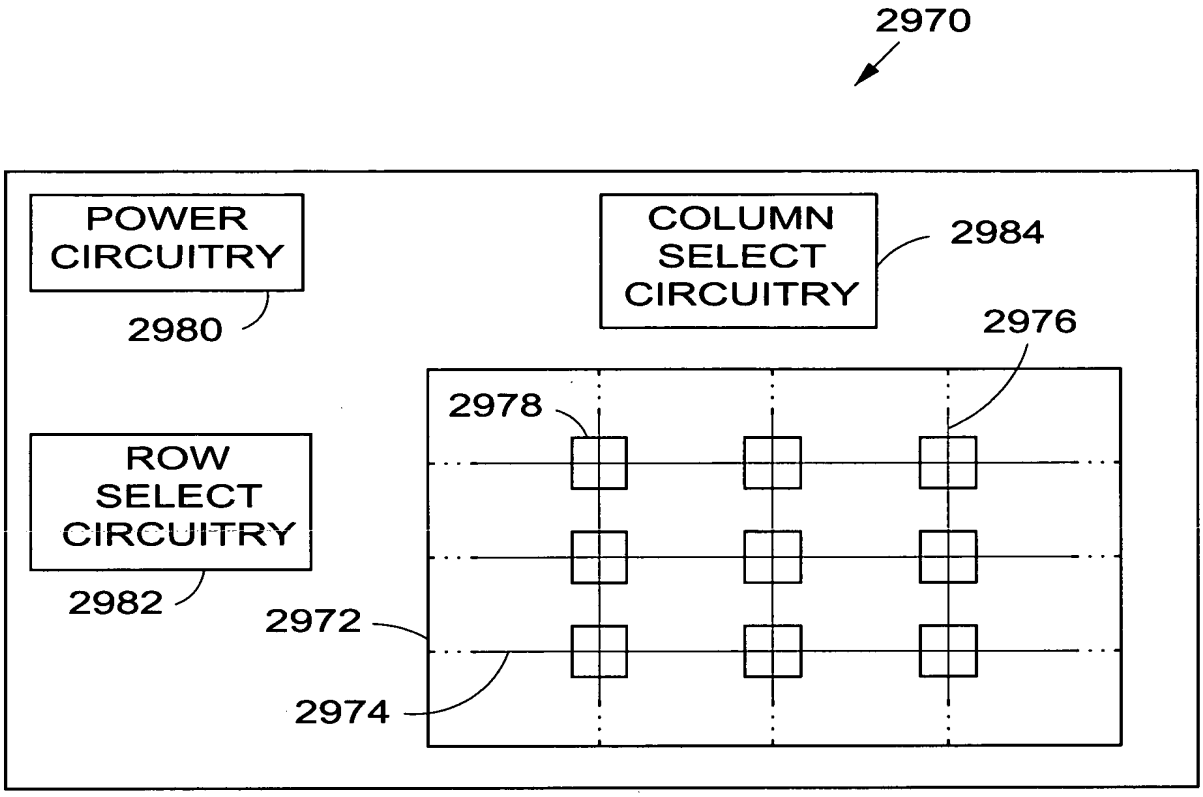


Fig. 29

Patent Application Publication Oct. 25, 2007 Sheet 22 of 22 US 2007/0246695 A1